REMARKS

Favorable reconsideration in view of the previous amendments and following remarks is respectfully requested.

Claims 1, 7-9 and 11 are pending.

The Office Action rejects claims 1, 7-9 and 11 under 35 U.S.C. §103(a) over U.S. Patent No. 4,142,555 to Satake et al. in view of U.S. Patent No. 5,599,599 to Mirmiran et al. and U.S. Patent No. 5,972,450 to Hsich et al. This rejection is respectfully traversed.

Applicant's independent 1 claim recites a fibre reinforced polymer outer tube including a majority of fibres oriented generally circumferentially around the fibre reinforced polymer outer tube, the fibers including at least one of a carbon, glass, aramid and resin material; a steel inner tube, the steel inner tube being hollow; and a concrete filler material provided between the outer tube and the steel inner tube.

These features encompass Applicant's exemplary embodiment illustrated in Fig. 1 wherein a double skin tubular structure member is provided having a fiber reinforced polymer outer tube 2 and an inner tube 3 made from generally metallic materials. A filler material including a bound aggregate material is provided between the outer tube 2 and the inner tube 3. The fibre reinforced polymer outer tube is formed along an entire length of the steel inner tube.

The Satake patent relates to the provision of a coating layer to prevent the metal pipe from corrosion.

In view of Satake's specific objective, the coating layer must be very thin (about 3 mm in the examples given) and must be able to cure rapidly (within 30 to 120 seconds). A primer layer may be needed between the coating layer and the

metal pipe to improve bonding. In addition, a very thin external cloth or sheet may be used to provide surface protection to the coated metal pipe. If the metal pipe is used to resist any external loading, it is only the metal pipe itself that provides the load resistance.

In Applicant's independent claim 1, the inner steel tube, the concrete layer (the filler material) and the FRP tube outside work together to resist external loading in a robust and ductile manner. Each of the three components plays a useful role in the providing a load resistance mechanism.

The main functions of the three components are as follows: the concrete resists axial compression, the steel tube resists both axial compression and axial tension, and the FRP tube confines the concrete so that the ductility and strength of the concrete are greatly improved. This load resistance function cannot be achieved by the Satake patent.

In the Satake patent, the metal pipe is the innermost layer, and this is followed by a possible (but not essential) primer layer, then by the corrosion-preventive coating layer, and then by a possible (not always present) cloth/sheet which may be a glass cloth. The corrosion-preventive coating layer generally includes a number of sub-layers, in order, a sub-layer without reinforcing solid particles, and a sub-layer with reinforcing solid particles for improved abrasion and impact resistance, and then possibly another layer without reinforcing solid particles. It must be noted the "filler" in the Satake patent refers to the solid particles and not the entire coating layer.

Therefore, if the external glass cloth is not used, the coated metal pipe of the Skate patent does not have an outer tube as in claim 1. Instead, it only has the inner metal pipe plus the coating layer (the primer is an optional layer between the metal

pipe and the corrosion-preventive coating layer). The reinforced polymer sub-layer of the coating layer is not comparable to the FRP tube in claim 1 as the solid particles do not provide the circumferential force resistance of the hoop fibers in the FRP.

The Examiner asserts that the Satake patent discloses a filler material between an outer and inner tube. The Examiner also asserts that Mirmiran discloses a filler material between the outer tube and the inner tube. However, claim 1 recites a concrete filler material provided between an outer tube and a steel tube. Mirmiran discloses a concrete core surrounded by a FRP portions and an exterior filament wound sheet. Neither Satake nor Mirmiran disclose a concrete filler provided between an outer tube and a steel tube.

If the external sheet is a glass cloth and is present in Satake, a person skilled in the art would not be motivated to replace the coating layer with a layer of concrete and the glass cloth of the Satake patent with an FRP tube with fibers oriented circumferentially.

The ordinarily skilled artisan would not have been motivated to use a concrete layer in Satake.

The Satake patent is directed mainly towards the coating of a metal pipe to prevent corrosion. This coating material must be able to cure rapidly to shorten the time from coating to handling, which is the first objective and the main advantage of the Satake patent. The Satake patent teaches that the coating needs be applied using an airless spray gun and needs to harden "in about 15-180 seconds, normally 30 to 120 seconds." Indeed, Satake teaches careful design of the two ingredients of the coating material in terms of the weight percentages. The compositions of the two

ingredients are clearly taught by the Satake patent, which obviously excludes concrete as a possible corrosion-preventive material for its purpose. As a result, a person skilled in the art would not be motivated to replace the coating layer in the Satake patent with a concrete layer as in claim 1 as the rapid curing requirement is the main advantage of the Satake patent and the use of concrete will completely defeat the purpose of the Satake patent. Concrete will take days (up to 7 days) to cure instead of 30 to 120 seconds as taught by Satake.

Another disadvantage with the replacement of the corrosion-preventive coating layer with a concrete layer is that the concrete will be much thicker and heavier so that the weight of the coating can become comparable to the pipe itself. In the three examples cited in the Satake patent, for pipes with diameters of 600 mm, 1000 mm and 1200 mm (these are similar to the diameters of large structural members), the corrosion-preventive material is applied in sub-layers of around 700-800 micrometers, so the total thickness of the coating layer is less than 3 mm. In a concrete layer, the maximum aggregate size is typically 20 mm. A concrete layer for corrosion protection of a metal pipe normally needs to exceed 30 mm in thickness. The weight of the concrete layer is similar to the weight of a 10 mm thick steel pipe. Therefore, a concrete layer for corrosion prevention would have doubled the weight of a steel pipe. Even such a concrete layer is unlikely to provide the same degree of corrosion protection to the metal pipe as concrete is not a good corrosion-preventive material.

Thirdly, the corrosion-preventive coating layer needs to be well bonded to the metal pipe as taught by the Satake patent and that is why the use of blast-gritting and primer is recommended to prepare the metal pipe before the application of the

corrosion-preventive coating layer. The use of a concrete layer will mean that there will be poor bonding between the concrete layer and the metal pipe and the concrete layer can easily peel off under operational conditions. In Applicant's claim, the concrete is contained by a strong FRP tube and good bonding between the concrete layer and the steel tube or the FRP tube is not required as long as the three components remain in tight contact. Therefore, a person skilled in the art would not be motivated to replace the corrosion-preventive coating layer with a concrete layer.

The ordinarily skilled artisan would not have been motivated to replace the external sheet of Satake with a FRP tube.

The Satake patent teaches the use of a very thin external sheet to be applied to the coating layer for surface protection when necessary. This sheet is a glass cloth impregnated with the corrosion-preventive material. It must be noted that this external sheet is optional in the Satake patent.

In the Satake patent, the external cloth is for protection of the outer surface of the coated metal pipe. In claim 1, the FRP tube is for the confinement of the concrete layer. The concrete layer expands under axial stresses and this expansion is contained by the FRP tube. This confinement of the concrete leads to significant increases in the axial compressive strength and ductility of the concrete layer. As a result, this FRP tube needs to be strong in the circumferential direction and to have a large amount of fibers in the circumferential direction.

In the Satake patent, only a very thin external sheet is needed as it is only for surface protection. The FRP tube of claim 1 would be much more expensive to manufacture due to the use of a much larger thickness and a much larger amount of glass or other fibers than the external sheet of the Satake patent so a person skilled

in the art would not be motivated to use such an FRP tube as the external protective sheet in Satake. Indeed, in Satake, this external sheet is not always needed, depending on applications.

Finally, in claim 1, the FRP tube functions as a form during construction for the casting of wet concrete. That is, the FRP tube is fabricated before the casting of concrete. In Satake, the thin external sheet is applied on the coating layer after the coating layer has been applied. The construction procedures are fundamentally different.

Satake differs fundamentally in the objectives from claim 1's claimed combination of features. The Satake patent mainly teaches the use of a thin (about 3 mm) corrosion-preventive coating layer on a metal pipe for corrosion prevention. In claim 1, the construction of a double-skin tubular structural member resists large axial and lateral loads.

In one particular embodiment, Satake includes a metal pipe inside, a corrosion-preventive coating layer in between, and a very thin glass cloth outside impregnated with the same corrosion-preventive material. The corrosion-preventive layer contains one or more sub-layers reinforced with solid particles such as sand for improved resistance to abrasion and impact. However, due to the different objectives, a person skilled in the art would have no motivation to replace the thin corrosion-preventive coating layer with a thick concrete layer and the thin external sheet with a much thicker FRP tube to arrive at claim 1's claimed combination of features. This is because such adaptations would defeat the purpose of the Satake patent.

An advantage of Satake is the carefully designed two-component coating material and the rapid curing required of the coating layer (curing within 30- 120 seconds). The coating layer has only a thickness of a few of millimeters (around 3 mm) so that the coating layer does not add significantly to the original weight of the metal pipe. Replacing the coating material with concrete will mean that curing will take a few days before the metal pipe can be handled and the concrete layer will be at least 30 mm thick and may easily double the weight of the metal pipe in many cases. In addition, the coating layer needs to be well-bonded to the metal pipe which cannot be achieved by a concrete layer.

The external sheet of the Satake patent is optional and when used, it is only a very thin sheet for surface protection. This external sheet is not required to resist any significant circumferential tensile force so there is no need to arrange most of the fibers in the circumferential direction in such a sheet. Therefore, a person skilled in the art would not be motivated to replace this thin sheet with a much thicker FRP tube with most of the fibers in the circumferential direction. Such an FRP tube does not have a useful function in Satake but will significantly increase the cost of the coated pipe and thus renders the Satake patent unacceptable since the purpose is for corrosion prevention only.

When an external sheet is not used, the Satake patent cannot be compared with claim 1 as the formation does not include an FRP tube at all. Although the coating layer contains sub-layers which may be reinforced using solid particles (such as sand) for improved resistance to abrasion and impact, such a reinforced polymer sub-layer cannot be compared with an FRP tube strongly reinforced with continuous glass fibers in the hoop direction to resist a large circumferential tensile force as

required by the present invention. Therefore, a person skilled in the art would not be motivated to replace such a sub-layer with a much thicker FRP tube with a large amount of fibers and with most of the fibers oriented in the hoop direction. Such an FRP tube does not have a useful function in Satake but will significantly increase the cost of the coated pipe and thus renders Satake unacceptable since the purpose is for corrosion prevention only.

Mirmiran and Hsich do not overcome the deficiencies of Satake noted above. Mirmiran discloses a concrete core. Hsich discloses a metal tube 10 having a first and second polymeric layers to eliminate vibration and noise. Neither reference discloses a concrete filler material provided between a steel inner tube and an outer tube.

Thus, Applicant respectfully requests withdrawal of the rejection of claim 1. Claim 9 is allowable for reasons similar to those presented above with respect to claim 1.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application, the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: September 10, 2009 By: _____

Michael Britton
Registration No. 47260

Customer No. 21839
703 836 6620